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AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1 - 10. *(Canceled).*

11. *(Currently Amended)* A method of transmitting a bit stream representing digitalized images to a user which requires a reduction of the bit stream, the method comprising:

encoding ~~a~~ the digitalized ~~image~~ images in a compressed discrete cosine transform (DCT) domain using DCTs of length N/2~~, comprising:~~ to produce a first encoded bitstream of coefficients;

receiving in a transcoder the first encoded bit stream;

undersampling in the transcoder, by removing selected ones of the coefficients, the compressed ~~frames~~ digitalized images represented by the first encoded bitstream by a certain factor in each dimension~~,~~; and

calculating, from the remaining coefficients, ~~a DCT~~ DCTs of length N x N, each of the DCTs of length N x N calculated directly from four adjacent DCT coefficient blocks of size N/2 x N/2 of the remaining coefficents, for each of the digitalized ~~image~~ images, N being a positive, even integer to produce a second encoded bitstream; and

transmitting from the transcoder the second encoded bit stream ~~including only the selected coefficients~~ to the user.

12. *(Currently Amended)* A method of transmitting a bit stream representing digitalized images to a user, the method comprising:

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encoding the digitalized images in a compressed discrete cosine transform (DCT) domain using DCTs of length N/2 to produce a first encoded bitstream of coefficients;

receiving in a transcoder the first encoded bit stream;

~~encoding a~~ recoding in the transcoder the digitalized ~~image~~ images represented ~~as a~~ by the coefficients in the first encoded bitstream to discrete cosine transform (DCT) transformed ~~sequence~~ sequences of coefficients of length N, N being a positive, even integer, to produce a second encoded bitstream, the recoding comprising:

calculating the coefficients of a DCT of length N directly from two sequences of DCT coefficients of length N/2,

wherein the two sequences of coefficients are obtained from DCTs of length N/2 and ~~represent~~ correspond to the first half and second half, respectively, of an original sequence of data of the digitalized images; and

transmitting from the transcoder the second encoded bit stream to the user.

13. *(Previously Presented)* A method according to claim 12, wherein the even coefficients of the DCT of length N are calculated as:

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$$X_{2k}=\sqrt{\frac{2}{N}}\varepsilon_{2k}\sum_{n=0}^{N-1}x_n\cos\frac{(2n+1)2\kappa\pi}{2N}$$

$$=\sqrt{\frac{2}{N}}\varepsilon_k\left\{\sum_{n=0}^{\frac{N}{2}-1}x_n\cos\frac{(2n+1)\kappa\pi}{2(N/2)}+\sum_{n=N/2}^{N-1}x_n\cos\frac{(2n+1)\kappa\pi}{2(N/2)}\right\}$$

$$=\sqrt{\frac{2}{N}}\varepsilon_k\left\{\sum_{n=0}^{\frac{N}{2}-1}y_n\cos\frac{(2n+1)\kappa\pi}{2(N/2)}+\sum_{n=0}^{\frac{N}{2}-1}x_{N-1-n}\cos\left[\frac{[2(N-1-n)+1]\kappa\pi}{2(N/2)}\right]\right\}$$

$$=\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}y_n\cos\frac{(2n+1)\kappa\pi}{2(N/2)}+\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}z_n\cos\frac{(2n+1)\kappa\pi}{2(N/2)}\right\}$$

$$=\sqrt{\frac{1}{2}}\left[Y_k+(-1)^kZ_k\right]$$

$$=\sqrt{\frac{1}{2}}\left[Y_k+Z'_k\right]\qquad k=0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k=X_{2k+1}$ as

$$R_k=R_k^{'}-R_{k-1}$$

where

$$R_k^{'}=\sqrt{\frac{2}{N}}\left\{\sum_{n=0}^{N-1}x_n\cos\frac{(2n+1)(2k+1)\pi}{2N}+\sum_{n=0}^{N-1}x_n\cos\frac{(2n+1)(2k-1)\pi}{2N}\right\}$$

$$=\frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}(y_n-z'_n)2\cos\frac{(2n+1)\pi}{2N}\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

$$=\frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}r_n\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

or

$$=\frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\ \{\text{ length-N/2 DCT-II of } r_n\ \}$$

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where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$
$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$
$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l (Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)} - \right\}2\cos\frac{(2n+1)\pi}{2N}$$
$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of $(Y_l - Z'_l)$, and where

$R'_k = X_{2k+1} + X_{2k-1}$.

or as

$$X_{2k+1} = \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\}$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2})\right]\right\}.$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N}\right\}$$
$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,\ldots,(N/2)-1.$$

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14. *(Currently Amended)* The method of claim 11, wherein N is equal to 2^m, m being a positive integer~~> 0~~.

15 - 21. *(Canceled)*

22. *(Previously Presented)* A method of transmitting a bit stream representing a digitalized image as a compressed video signal which includes coefficients obtained by calculating DCTs for blocks of size N/2 x N/2, the blocks being obtained by dividing the digitalized image, to a plurality of users, at least one of which requires a reduction of the bit stream or down-scaling of the corresponding compressed video signal, the method comprising:

receiving in a transcoder the bit stream of the compressed video signal;

extracting from the received bit stream the coefficients for the blocks of size N/2 x N/2;

collecting the extracted coefficients for four adjacent blocks of size N/2 x N/2, the groups of four adjacent blocks forming together non-overlapping blocks of size N x N in the digitalized image;

calculating, from the collected coefficients, coefficients of the DCTs for the blocks of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N or using DCTs and IDCTs for blocks of the size N/2 x N/2 and without using DCTs or IDCTs of length N x N,

selecting, from the calculated coefficients, coefficients of the lowest frequencies; and

transmitting to the at least one user a bit stream including only the selected coefficients.

23. *(Previously Presented)* A method of transmitting a bit stream representing a digitalized image as a compressed video signal, which includes coefficients obtained by

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calculating DCTs for blocks of size N x N, the blocks being obtained by dividing the digitalized image, to a plurality of users, at least one of which requires a reduction of the bit stream or down-scaling of the corresponding compressed video signal, the method comprising:

receiving in a transcoder the bit stream of the compressed video signal;

extracting, from the received bit stream, the coefficients for the blocks of size N x N;

collecting the extracted coefficients for four adjacent blocks of size N x N, the groups of four adjacent blocks forming together non-overlapping blocks of size 2N x 2N in the digitalized image;

selecting, from the collected, extracted coefficients for each block of size N x N of each of the groups of four adjacent blocks of the size N x N, coefficients of N/2 x N/2 lowest frequencies;

calculating, from the selected coefficients for each of the groups, coefficients of the DCT for a block of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using DCTs or IDCTs of length N x N, and

transmitting to the at least one user a bit stream including only the calculated coefficients.

24. *(Currently Amended)* The method of claim 23, wherein, in the step of calculating coefficients of DCTs for blocks of size N x N the even coefficients of a DCT of length N ~~is~~ are calculated as:

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$$X_{2k} = \sqrt{\frac{2}{N}}\varepsilon_{2k}\sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2\kappa\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]\kappa\pi}{2(N/2)}\right] \right\}$$

$$= \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + (-1)^k Z_k\right]$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + Z'_k\right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R_k^{'} - R_{k-1}$$

where

$$R_k^{'} = \sqrt{\frac{2}{N}} \left\{ \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N} \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

or

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \{ \text{length-N/2 DCT-II of } r_n \}$$

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where

$$
\begin{aligned}
r_n &= (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N} \\
&= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N} \\
&= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l (Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)} - \right\}2\cos\frac{(2n+1)\pi}{2N} \\
&= g_n 2\cos\frac{(2n+1)\pi}{2N}
\end{aligned}
$$

where

g_n is a length-N/2 IDCT of $(Y_l - Z'_l)$, and

$R'_k = X_{2k+1} + X_{2k-1}$,

or as

$$
\begin{aligned}
X_{2k+1} &= \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N} \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\} \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2})\right]\right\}. \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N}\right\} \\
&= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,\ldots,(N/2)-1.
\end{aligned}
$$

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25. *(Previously Presented)* A transmission system for transmitting digitalized images where users are connected to each other through a multi-node control unit and bit streams of digitalized images corresponding to compressed video signals are transmitted between the users, the compressed video signal including coefficients obtained by calculating discrete cosine transforms (DCTs) for blocks of size N/2 x N/2 obtained by dividing the digitalized image,

- a first one of the users, for receiving a bit stream transmitted from a second one of the users, requiring a reduction of the bit stream or down-scaling of the corresponding compressed video signal,

the multi-node control unit comprising:

- means for receiving said bit stream from the second one of the users and for extracting from the bit stream coefficients for blocks of size N/2 x N/2 in a corresponding digitalized image;

- means for collecting the extracted coefficients for four adjacent blocks of size N/2 x N/2;

- means for calculating from the collected coefficients coefficients for a DCT for a block of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using DCTs or IDCTs of length N x N;

- means for selecting, from the calculated coefficients, coefficients for the lowest frequencies, and

- means for transmitting to the first one of the users a bit stream including only the selected coefficients.

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26. *(Previously Presented)* A transmission system for transmitting digitalized images, the system including users connected to each other through a multi-node control unit,

- bit streams of digitalized images being compressed video signals being transmitted between the users, the compressed video signal for a digitalized image comprising coefficients obtained by calculating DCTs for blocks of size N x N obtained by dividing the digitalized image,

- a first one of the users, for receiving a bit stream transmitted from a second one of the users, requiring a reduction of the bit stream or down-scaling of the corresponding compressed video signal,

the multi-node control unit comprising:

- means for receiving said bit stream from the second one of the users and for extracting from the bit stream coefficients for blocks of size N x N in a corresponding digitalized image;

- means for collecting the extracted coefficients for four adjacent blocks of size N x N;

- means for selecting, from the extracted coefficients for each of the four adjacent blocks, coefficients for N/2 x N/2 lowest frequencies;

- means for calculating, from the selected coefficients, coefficients for a DCT for a block of size N x N using DCTs and IDCTs of length N/2 and without using DCTs or IDCTs of length N or using DCTs and IDCTs for blocks of size N/2 x N/2 and without using DCTs or IDCTs of length N x N; and

- means for transmitting to the first one of the users a bit stream including only the calculated coefficients.

27. *(New)* The method of claim 22, wherein, in the step of calculating coefficients of DCTs for blocks of size N x N the even coefficients of a DCT of length N are calculated as:

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$$X_{2k} = \sqrt{\frac{2}{N}}\varepsilon_{2k}\sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2\kappa\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k\left\{\sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)}\right\}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k\left\{\sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]\kappa\pi}{2(N/2)}\right]\right\}$$

$$= \sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)}\right\}$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + (-1)^k Z_k\right]$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + Z'_k\right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}}\left\{\sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N}\right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1}(y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

or

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\ \{\text{ length-N/2 DCT-II of } r_n\ \}$$

where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$
$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)}\right\}2\cos\frac{(2n+1)\pi}{2N}$$
$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l (Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)} - \right\}2\cos\frac{(2n+1)\pi}{2N}$$
$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of $(Y_l - Z'_l)$, and

$R'_k = X_{2k+1} + X_{2k-1}$,

or as

$$X_{2k+1} = \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\}$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2})\right]\right\}.$$
$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N}\right\}$$
$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,\ldots,(N/2)-1.$$

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28. *(New)* The transmission system of claim 25, wherein the means for calculating calculates the even coefficients of the DCT of length N as:

$$X_{2k} = \sqrt{\frac{2}{N}}\varepsilon_{2k}\sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)2\kappa\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=N/2}^{N-1} x_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{2}{N}}\varepsilon_k \left\{ \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sum_{n=0}^{\frac{N}{2}-1} x_{N-1-n} \cos\left[\frac{[2(N-1-n)+1]\kappa\pi}{2(N/2)}\right] \right\}$$

$$= \sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} + \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \right\}$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + (-1)^k Z_k\right]$$

$$= \sqrt{\frac{1}{2}}\left[Y_k + Z'_k\right] \qquad k = 0,1,\ldots,(N/2)-1.$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R'_k - R_{k-1}$$

where

$$R'_k = \sqrt{\frac{2}{N}} \left\{ \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N} \right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N} \cos\frac{(2n+1)k\pi}{2(N/2)} \right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \left\{ \sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)} \right\} \quad ;$$

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or

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \text{ \{ length-N/2 DCT-II of } r_n \text{ \}}$$

where

$$r_n = (y_n - z'_n) 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)} \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{ \sqrt{\frac{2}{N/2}} \sum_{l=0}^{\frac{N}{2}-1} \varepsilon_l (Y_l - Z'_l) \cos\frac{(2n+1)l\pi}{2(N/2)} - \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of $(Y_l - Z'_l)$, and where

$R'_k = X_{2k+1} + X_{2k-1}$.

or as

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$$X_{2k+1} = \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi+\frac{\pi}{2})\right]\right\}$$

$$= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N}\right\}$$

$$= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k),\quad k = 0,1,\ldots,(N/2)-1.$$

29. *(New)* The transmission system of claim 26, wherein the means for calculating calculates the even coefficients of the DCT of length N as:

$$X_{2k} = \sqrt{\frac{1}{2}}\left[Y_k + (-1)^k Z_k\right] \qquad k = 0,1,\ldots,(N/2)-1.$$

$$Y_k = \sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1} y_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \qquad k = 0,1,\ldots,(N/2)-1.$$

$$Z_k = \sqrt{\frac{2}{N/2}}\varepsilon_k\sum_{n=0}^{\frac{N}{2}-1} z_n \cos\frac{(2n+1)\kappa\pi}{2(N/2)} \qquad k = 0,1,\ldots,(N/2)-1$$

and the odd coefficients $R_k = X_{2k+1}$ as

$$R_k = R_k^{'} - R_{k-1}$$

where

$$R_k^{'} = \sqrt{\frac{2}{N}}\left\{\sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k+1)\pi}{2N} + \sum_{n=0}^{N-1} x_n \cos\frac{(2n+1)(2k-1)\pi}{2N}\right\}$$

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$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1}(y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}\cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}}\left\{\sqrt{\frac{2}{N/2}}\varepsilon_k \sum_{n=0}^{\frac{N}{2}-1} r_n \cos\frac{(2n+1)k\pi}{2(N/2)}\right\}$$

or

$$= \frac{1}{\varepsilon_k}\sqrt{\frac{1}{2}} \{ \text{ length-N/2 DCT-II of } r_n \}$$

where

$$r_n = (y_n - z'_n)2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Y_l \cos\frac{(2n+1)l\pi}{2(N/2)} - \sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l Z'_l \cos\frac{(2n+1)l\pi}{2(N/2)}\right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= \left\{\sqrt{\frac{2}{N/2}}\sum_{l=0}^{\frac{N}{2}-1}\varepsilon_l (Y_l - Z'_l)\cos\frac{(2n+1)l\pi}{2(N/2)} - \right\} 2\cos\frac{(2n+1)\pi}{2N}$$

$$= g_n 2\cos\frac{(2n+1)\pi}{2N}$$

where

g_n is a length-N/2 IDCT of $(Y_l - Z'_l)$, and where

$R'_k = X_{2k+1} + X_{2k-1}$.

or as

$$
\begin{aligned}
X_{2k+1} &= \sqrt{\frac{2}{N}}\varepsilon_{2k+1}\sum_{i=0}^{N-1} x_i \cos\frac{(2i+1)(2\kappa+1)\pi}{2N} \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} x_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} x_{i+N/2}\cos\frac{(2i+N+1)(2k+1)\pi}{2N}\right\} \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + \sum_{i=0}^{\frac{N}{2}-1} z_i \cos\left[\frac{(2i+1)(2k+1)\pi}{2N} + (k\pi + \frac{\pi}{2})\right]\right\}. \\
&= \sqrt{\frac{2}{N}}\left\{\sum_{i=0}^{\frac{N}{2}-1} y_i \cos\frac{(2i+1)(2k+1)\pi}{2N} + (-1)^{k+1}\sum_{i=0}^{\frac{N}{2}-1} z_i \sin\frac{(2i+1)(2k+1)\pi}{2N}\right\} \\
&= \sqrt{\frac{2}{N}}(X1_k - (-1)^k X2_k), \quad k = 0,1,\ldots,(N/2)-1.
\end{aligned}
$$

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